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DEVELOPMENT OF THE PETROLEUM INDUSTRY IN THE UNITED ARAB REPUBLIC

By A. MUSTAFA, D. Sc.,
Cairo University,

I. K. ABDO, Ph. D.,
National Research Centre

M. BORHAM, Ph. D.,
General Petroleum Corp.

and F. M. EBEID, Ph. D.,
National Research Centre

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No.423 DEVELOPMENT OF THE PETROLEUM INDUSTRY

A.4.2.3. IN THE UNITED ARAB REPUBLIC

by A. MUSTAFA, D.Sc., Cairo University
I.K. ABDO, Ph. D., National Research Centre
M. BORHAM, Ph. D., General Petroleum Corp.
F.M. EBEID, Ph. D., National Research Centre

1. Marked progress had been achieved in the petroleum industry of the UAR during the last decade, a fact which resulted in an increase of 12 million pounds in the national income in the year 1960 as compared to the year 1952. The authors will try to illustrate the development in various branches of the industry, with special emphasis on the methods, adopted and/or under consideration for the full utilisation of local crude oils to satisfy the country's needs from different petroleum fractions, and petrochemical raw materials and finished products.

Exploration and Production.

2. Although the UAR was one of the oldest oil-producing countries in the world, yet, up to 1951 there were only four producing fields. During the last decade, seven oil fields were newly discovered, making a total of eleven. Intensive geological exploration is being carried out, applying up-to-date methods. Marine geophysical techniques have also been recently introduced. The expansion in the drilling activity could be represented by the rise in number of drilling units from one unit in 1952 to 14 units in 1961, including turbo-drillers. As a result, crude oil production has increased from 2.5 million cubic meters in 1951 to 4.2 million cubic meters in 1961.

Characteristics of Crude Oils.

3. Indigenous crude oils are of the mixed-base or intermediate type, generally characterised by their low percentage yield of distillates, and high contents of sulphur, resinous materials, and asphaltic residues. Table I shows the general characteristics of the main crudes of the UAR.

Processing.

4. The crude processed in local refineries has increased from 2.5 million metric tons in 1951 to about 5.0 million metric tons in 1961. The major units in standing refineries include atmospheric and vacuum distillation, thermal reforming, asphalt blowing, hydrogen sulphide separation and sulphur production, and conventional treating equipment.

Production and Consumption Picture.

5. Table II represents the % yields of different fractions which could be obtained from local crudes under the present processing conditions. These figures are based on the production of mazout with a maximum Redwood N° 1 viscosity of 2000 seconds at 100°F. Table III represents, on the other hand, a comparison of the consumption picture in 1951 with that in 1961.

6. It could be easily noted from tables II and III, that, processing of local crudes in the existing refineries should lead to a surplus in gasoline and mazout, and a serious shortage in middle distillates. At present, the situation is being remedied by exporting part of our heavy crudes, and importation of crudes rich in middle distillates.

Projects under the Five-Year Plan.
Suez Refinery Expansion.

7. In order to balance the production and comsumption rates and attain self-sufficiency of almost all petroleum products, a new refinery is under erection in Suez, with a crude oil capacity of 2.0 million metric tons. The first units will be on stream in late 1963. This refinery expansion is primarily for the production of distillate fuels. These are Kerosene, gas oil, and diesel fuels. Other petroleum products are propane, butane, light naphtha, gasolene, fuel oil, coke, and fuel gas. Petrochemical products are sulphur, benzine and/or toluene, and dodecy/benzine.

8. The new facilities are designed to process 5,000 MT/SD of Skimmed Balayim crude, 370 MT/SD of lube oil plant asphalt, and 1430 MT/SD of a 50/50 mixture of Arabian and Balayim naphthas. A delayed coking unit will charge Balayim residue, after atmospheric and flash distillation, to remove gasoline and middle distillates consequently. Products from this unit will include gases, gasoline, middle distillates, and coke.

9. In order to improve the quality of gasoline, a catalytic reforming unit will be included. Coker gasoline, in combination with straight run gasoline from other standing units, will be first fractionated to yield a light naphtha cut with a 160° Fend point (for use as feed stock in the manufacture of petrochemical starting materials via steam pyrolysis). The heavy naphtha, after being desulphurised, represents the feed for the catalytic reformer. The main product will be a stabilized reformate having a 100 octane number, clear (by the Research Method).

10. Hydrogen, as a by-product from the reformer, will be utilized for hydrofining virgin middle distillates. A second hydrofining unit will be used for stabilizing, and desuphurising the coker middle distillate fraction. Additional hydrogen requirements for this unit will be satisfied by steam-reforming of light gases (C_1 and C_2). The final kerosene, gas oil, and diesel oil fractions will have 0.02, and 0.25, and 0.50% by weight sulphur contents, respectively.

11. The different gas streams, after fractionation, and Hydrogen sulphide removal (through ethanolamine extraction and alkali

treating), will be distributed to the following sections: Hydrogen Production Plant, Dodecylbenzine Plant, Sulphur production plant, and Butagas bottling section. Surplus light gases ($C_1$4 C_2) will be fed to a neighbouring fertilizer plant, and partly used as fuel.

12; At the present time, the country depends completely on importation to satisfy it's needs from benzol and toluene. Hence, a Udex extraction unit will be incorporated to separate benzol and/or toluene from suitable reformate fractions.Part of the benzol product will be utilized for the production of dodecylbenzene. The plant will include a tetramer unit, and a dodecylbenzene production unit. The erection of this plant is expected to considerably ease up the situation with regard to the consumption of edible oils and fats in soap manufacturing industries.

13. Most of the coke product from the coking unit will find use as fuel in a steam-raising power-station. Active research is being carried out to improve the quality of this coke,and/or to find other fields of application.

Production of Lubricating oil Base Stocks.

14. A lubricating oil plant, with a capacity of 60.000 metric tons/year, will be on stream in 1964. This plant will include atmospheric and vacuum distillation, propane deasphalting, phenol extraction, solvent dewaxing, vacuum rerunning, absorption filtration , and blending and compounding units. Wax treating and moulding units will be also included, for the production of paraffin wax. Table IV summarizes the estimated production of petroleum fractions, and petrochemical raw materials and products in 1964.

Petrochemicals.

15. A project for the production of petrochemicals is presently under study.The surplus light naphtha,and hydrocarbon gases from the coking complex will form the starting material, for the production of the following petrochemicals:

Polyethylene	10,000 T/Y
Polyvinylchloride	10,000 T/Y
Synthetic rubber	8,000 T/Y
Polyacrylonitrile	5,000 T/Y
Methanol	4,000 T/Y
Benzol hexachloride	1,800 T/Y
Phenol	6,600 T/Y
Caprolactam	3,000 T/Y
Calcium nitrate, 15.5 % N	458,000 T/Y
Calcium ammonium nitrate,20.5%N	212,000 T/Y

Technical and economic studies are under way to select the most suitable methods, and it is expected that this project will be executed in the next few years.

Research.

16. A thorough study of the chemical nature of local crude oils is in progress.This includes the study of the distribution of

hydrocarbon types, sulphur and nitrogen compounds, and metallic constituents throughout the whole boiling range of each crude, as well as the resinuous fraction and asphaltic residues. Such studies are a prerequisite to the successful processing of any crude.

17. In Balayim crude oil, it has been found that the aromatic nature increases sharply from gasoline to Kerosene , and goes up with rising boiling point. As regards the sulphur compounds, it has been established that the major fraction of sulphur compound types in Balayim distillates is represented by sulphides and thiophenes, while the mercaptan and disulphide sulphur contents are negligible. The nitrogen contents of U.A.R. crudes differ widely from field to field, and amounts to 1.25% by weight in some instances. The realization of the serious effect of certain types of nitrogen compounds upon the performance of catalysts, and the storage stability of petroleum products, has initiated research activities in the field of nitrogen type analysis.

18. As an alternative to the coking process, hydrocracking of the whole crude is under intensive study. Batch-scale experiments show marked differences between various catalysts as regards the yield of liquid products and their fractional compositions, the % Hydrogen consumption, and the rates of desulphurisation and denitrogenation reactions.

19. Balayim and Ras-Gharib crude oils contain vanadium, and nickel in the range of 150, and 100 p.p.m. consequently. These figures are relatively high when compared with those of other crude oils produced in other Middle-East areas. The problem presented by the large production of straight run gasoline has focussed attention on investigations in the field of catalytic reforming of local gasolines for the production of aromatics; benzene, toluene, or zylenes. Production of benzene, for example, from a 65-86°c fraction of Gharib gasoline, was investigated. This fraction was found to contain 27.1 volume % methylcyclopentane and 20.4 % cyclohexane. Catalytic reforming of this fraction under optimum operating conditions produced benzene 89.5% yield of theoretical.

20. Other topics of research include:
    (a) Reforming of wide boiling range naphthas,
    (b) Isomerisation of the C_5-C_6 fraction of gasoline,
    (c) Oxidation of paraffin wax,
    (d) Production of lubricating oil base stocks from local crudes,
    (e) Production of pure ring compounds from petroleum,
    (f) Effect of gamma irradiation on the use properties of lubricating oil base stocks,
    (g) Utilisation of local clays as catalysts, and/or as catalyst carriers, or in adsorbent refining. Success has already been attained in this application whereby local clays will be used for the adsorbent refining of light and medium lube oil cuts in the projected lube oil plant.

Petroleum Research Centre.

21. A new petroleum research centre will be established in the near future. This centre will be concerned with local problems connected with the refining, transportion, and utilization of crude oil and all petroleum products. Fields of investigations will cover petroleum geology, production, chemistry, refining, petrochemicals, economics, as well as pilot plant studies.

Arab Petroleum Congress.

22. Since 1959, a petroleum congress had been annually held in one or the other of the Arab Countries, under the auspices of the Arab League. Non-member countries, as well as representatives of oil companies, are also invited to participate. Under its agenda, problems in the fields of oil geology, exploration, production, chemistry, processing, transport and economy are being discussed.

23. To conclude, it does not fail us to point out that full international cooperation has been a significant factor in the development of the petroleum industry in the U.A.R. The progress already achieved is a living example of the blessings of such cooperation between the highly developed, and the developing countries.

TABLE I

PHYSICAL CHARACTERISTICS OF MAIN UAR CRUDE OILS

Characteristic	Balayim	Ras Gharib	Rudeis Sudri	Ras Bakr	Sudr
A P I gravity	22.14	24.85	24.68	21.47	22.67
Water content, % by volume	0.20	0.20	0.05	0.10	0.15
Salt content, % by weight	0.020	0.015	0.002	0.016	0.005
Pour point, of	30	30	40	30	30
Viscosity, Red.1 at 100°F	300	110	180	617	266
R.V.P., p.s.i:	4.8	4.4	4.0	2.8	1.3
Sulphur content, % by weight	2.8	2.95	2.1	4.5	1.9
Conradson Carbon Content	10.5	8.5	10.0	10.3	9.7
Engler Distillation:					
I.B pt, C°	75	68	58	75	111
% recovery to 100°C	4.0	4.0	6.0	3.0	--
125°C	7.0	7.5	10.0	5.0	2.5
150°C	10.5	11.5	14.0	8.5	6.0
175°C	14.0	15.5	18.0	12.0	9.0
200°C	17.0	19.0	22.0	14.5	13.0
225°C	20.0	23.0	26.0	18.0	16.0
250°C	23.5	26.5	30.0	22.0	20.5
275°C	27.5	31.0	34.0	26.0	24.5
300°C	32.0	35.0	38.0	30.0	28.0
Ash content, % by weight	0.06	0.028	--	0.035	0.032

TABLE II

% REFINERY DISTILLATION YIELDS FROM U.A.R. CRUDE OILS

Product	Balayim	Ras Gharib	Ras Bakr	Sudr
Light Gases	6.78	1.07	0.39	0.65
Butagas	0.18	0.61	0.25	0.38
Gasoline	6.72	8.93	7.80	2.63
kerosene	----	5.56	----	8.74
Gas Oil	----	2.78	----	1.22
Diesel Oil	----	3.51	----	----
Mazout	86.94	72.13	86.36	80.99
Fuel gas	3.00	3.00	3.00	3.00
Loss	2.38	2.41	2.20	2.39
Total	100.00	100.00	100.00	100.00

TABLE III

COMPARISON OF CONSUMPTION FIGURES IN 1951 and 1961

Product	1951		1961	
	metric tons	% of total	metric tons	% of total
Light gases for fertilizer plant	----	----	30.000	0.7
Butane	2,900	0.1	25,000	0.5
Gasoline	265,000	8.6	253,000	5.6
Kerosene	631,000	20.6	756,000	16.6
Gas oil	200,000	6.5	634,000	13.9
Diesel oil	178,000	5.8	253,000	5.1
Mazout	1,701,000	55.6	2,440,000	53,4
Lubricants and greases	40,000	1.3	55.000	1.2
Bitument and Cut backs	45,000	1.5	118,000	2.5
Total	3,062,900	100.00	4,564.000	100.00

TABLE IV

ESTIMATED REFINERY'S PRODUCTION IN 1964

Product	Production in metric tons
Light gases	85,000
Propane	46,000
Butane	67,000
Light naphtha	120,000
Gasoline, 100 O.N.	156,000
Gasoline, 85 O.N.	275,000
Kerosene	830,000
Solar	472,000
Diesel	337,000
Mazout	2,893,000
Asphalt	155,000
Sulphur	30,000
Lube oil base stocks	60,000
Greases	9,000
Paraffin wax	6,400
Benzol	3,000
Dodecylbenzene	6,000
Coke	382,000
Fuel gases and loss	512,000
Total	6,445,000

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